July 29, 2000

Mr. J. A. Scalice
Chief Nuclear Officer
and Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2 - ISSUANCE OF EXEMPTION FROM THE REQUIREMENTS OF 10 CFR 50.44, 50.46, AND 10 CFR PART 50, APPENDIX K, TO ALLOW THE USE OF THE M5 ALLOY FOR FUEL CLADDING AND STRUCTURAL MATERIAL (TAC NOS. MA8223 AND MA8224)

Dear Mr. Scalice:

In response to your application dated February 11, 2000, the U.S. Nuclear Regulatory Commission has issued the enclosed exemption from the requirements of Title 10, *Code of Federal Regulations* (10 CFR) Section 50.44, "Standard for Combustible Gas Control in Light-Water-Cooled Power Reactors," 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors," and 10 CFR Part 50, Appendix K, "ECCS Evaluation Models." These regulations assume the use of zircaloy or ZIRLO fuel rod cladding material in the acceptance criteria and in the fuel cladding performance evaluation for normal operation, anticipated operational occurrences and accident conditions. This exemption from the regulations allows Sequoyah Nuclear Plant, Units 1 and 2, to use a newly designed fuel cladding and structural material, designated M5, developed by Framatome Cogema Fuels.

Based on its review, the staff finds that granting an exemption from the requirements listed above is authorized by law, will not present an undue risk to public health and safety, is consistent with the common defense and security, and that special circumstances described in 10 CFR 50.12(a)(2)(ii) are present. Accordingly, your request has been granted.

A copy of the exemption has been forwarded to the Office of the Federal Register for publication.

Sincerely,

/RA/

Ronald W. Hernan, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Enclosure: Exemption

cc w/enclosure: See next page

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Based on its review, the staff finds that granting an exemption from the requirements listed above is authorized by law, will not present an undue risk to public health and safety, is consistent with the common defense and security, and that special circumstances described in 10 CFR 50.12(a)(2)(ii) are present. Accordingly, your request has been granted.

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Project Directorate II
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7590-01-P

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
Tennessee Valley Authority	)	Docket Nos. 50-327 and 50-328
	)	
(Sequoyah Nuclear Plant, Units 1 and 2)	)	
	)	

EXEMPTION

I.

The Tennessee Valley Authority (TVA or the licensee) is the holder of Facility Operating License No. DPR-77 for operation of the Sequoyah Nuclear Plant, Unit 1, and DPR-79 for Unit 2. The licenses provide, among other things, that the licensee is subject to all rules, regulations, and orders of the U.S. Nuclear Regulatory Commission (Commission or NRC) now or hereafter in effect.

The Sequoyah units are pressurized water reactors located in Hamilton County, Tennessee.

II.

By application dated February 11, 2000, TVA requested an exemption from the requirements of Title 10 of the Code of Federal Regulations, Section 50.44 (10 CFR 50.44), "Standard for Combustion Gas Control in Light-Water-Cooled Power Reactors," 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems [ECCS] for Light Water Nuclear Power Reactors," and 10 CFR Part 50, Appendix K, "ECCS Evaluation Models." These regulations set forth requirements for use of zircaloy or ZIRLO fuel rod cladding material by specifying acceptance criteria for ECCS and the fuel cladding performance evaluation for

normal operation, anticipated operational occurrences and accident conditions. Specifically, 10 CFR 50.46 contains acceptance criteria for ECCS for light water nuclear power reactors fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding. Further, 10 CFR 50.46 states that ECCS cooling performance following postulated loss-of-coolant accidents (LOCA) must be calculated in accordance with an acceptable evaluation model. Appendix K to 10 CFR Part 50 contains the required and acceptable features for ECCS evaluation models. Finally, 10 CFR 50.44 contains requirements for the control of hydrogen gas that may be generated after a postulated LOCA in light water power reactors fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding. Because TVA proposes to use a fuel cladding that is not specified in the rule, TVA sought an exemption from these regulations in order to use a newly designed cladding and structural material, designated M5, developed by Framatome Cogema Fuels (FCF). The licensee's exemption request was submitted in conjunction with an application for operating license amendments to revise the Sequoyah Unit 1 and 2 Technical Specifications to allow use of the M5 alloy for fuel rod cladding. The proposed amendment will be issued concurrently with this exemption. Together, the exemption and amendments will allow M5 to be used at both Sequoyah units.

Pursuant to 10 CFR 50.12, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 50 when (1) the exemptions are authorized by law, will not present an undue risk to public health and safety, and are consistent with the common defense and security, and (2) when special circumstances are present. Special circumstances are present whenever, according to 10 CFR Part 50.12(a)(2)(ii), "Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule."

III.

TVA proposes to use M5 for fuel rod cladding, fuel assembly spacer grids, fuel rod end plugs, the fuel assembly guide, and instrument tubes. M5 is an alloy composed of approximately 99 percent zirconium and 1 percent niobium, is designed for high fuel rod burnup conditions, and exhibits superior corrosion resistance and reduced irradiation-induced growth. In September 1997, FCF submitted Topical Report BAW-10227P, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel," for NRC staff review. The topical report justified the use of M5 as cladding and structural material in pressurized-water reactor cores and provided the licensing basis for the FCF advanced cladding and structural material. In a safety evaluation report (SER) dated February 4, 2000, NRC approved Topical Report BAW-10227P, concluding that the M5 properties and the mechanical design methodology, as defined in BAW-0227P, "are in accordance with SRP [Standard Review Plan] Section 4.2, 10 CFR 50.46, and 10 CFR Part 50, Appendix K and therefore, are acceptable for reload licensing applications up to rod averaged burnup levels of 62,000 MWd/MTU and 60,000 MWd/MTU for Mark B and Mark-BW fuel designs, respectively." The staff SER and the approved topical report were published on February 11, 2000, as BAW-10227P-A. The staff has determined that BAW-10227P-A is applicable to Sequoyah because the fuel designs are consistent with the requirements of the topical report.

The underlying purpose of 10 CFR 50.46 is to ensure that facilities meet the appropriate acceptance criteria for ECCS. The rule, however, expressly applies only to reactors fueled with the use of zircaloy-clad or ZIRLO-clad fuel pellets. In its topical report, FCF demonstrated that the ECCS acceptance criteria, which are applied to reactors fueled with zircaloy- or ZIRLO-clad fuel, are also applicable to reactors fueled with M5 fuel rod cladding and structural material. The staff has determined that this finding is applicable to Sequoyah because the fuel designs are consistent with the requirements of the topical report. Thus, the performance of M5-clad

material is similar to that of zircaloy- and ZIRLO-clad fuel and application of the regulation (i.e., using zircaloy or ZIRLO) is not necessary to achieve the underlying purpose of 10 CFR 50.46.

The underlying purpose of 10 CFR 50.44 and 10 CFR Part 50, Appendix K, is to ensure that cladding oxidation and hydrogen generation are appropriately limited during a LOCA and conservatively accounted for in the ECCS evaluation model. These regulations set forth requirements for the plants that use either zircaloy- or ZIRLO-clad fuel. Specifically, Paragraph I.A.5 of 10 CFR Part 50, Appendix K, requires that the Baker-Just (B-J) equation be used in the ECCS evaluation model to determine the rate of energy release, cladding oxidation, and hydrogen generation. This equation conservatively bounds all post-LOCA scenarios. In the SE that approved Topical Report BAW-10227P, the NRC staff concluded that the B-J correlation is conservative for determining high temperature M5 oxidation for LOCA analysis, and that the correlation is acceptable for LOCA ECCS analysis up to the currently approved burnup levels. The staff has determined that this finding is applicable to Sequoyah because the fuel designs are consistent with the requirements of the topical report. Therefore, when M5 is used as fuel rod cladding and structural material, the B-J correlation conservatively bounds post-LOCA scenarios and ECCS evaluation model criteria will be met. Application of the rule (i.e., the use of zircaloy or ZIRLO) is not necessary to achieve the underlying purpose of 10 CFR 50.44 and 10 CFR Part 50, Appendix K.

Based on this evaluation, the staff has determined that application of the criteria in 10 CFR 50.44 and 10 CFR Part 50, Appendix K, Paragraph I.A.5, is appropriate given the similarities in the performance of M5-clad fuel rods and zircaloy- and ZIRLO-clad fuel. Therefore, special circumstances exist to grant an exemption in that application of the regulations (i.e., the use of zircaloy or ZIRLO) is not necessary to achieve the underlying purpose of the rules cited above.

IV.

Accordingly, the Commission has determined that, pursuant to 10 CFR Part 50.12, an exemption is authorized by law and will not present an undue risk to the public health and safety and is consistent with the common defense and security. The Commission has determined that, pursuant to 10 CFR 50.12(a)(2)(ii), special circumstances are present, as noted in Section III above. Therefore, an exemption is hereby granted from the requirements of 10 CFR 50.44, 10 CFR 50.46, and 10 CFR Part 50, Appendix K, to allow use of the M5 alloy.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will have no significant impact on the quality of the human environment (65 FR 20209).

This exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

John A. Zwolinski, Director
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland
this 29th Day of July 2000

IV.

Accordingly, the Commission has determined that, pursuant to 10 CFR Part 50.12, an exemption is authorized by law and will not present an undue risk to the public health and safety and is consistent with the common defense and security. The Commission has determined that, pursuant to 10 CFR 50.12(a)(2)(ii), special circumstances are present, as noted in Section III above. Therefore, an exemption is hereby granted from the requirements of 10 CFR 50.44, 10 CFR 50.46, and 10 CFR Part 50, Appendix K, to allow use of the M5 alloy.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will have no significant impact on the quality of the human environment (65 FR 20209).

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Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland
this 29th Day of July 2000

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NAME	RHernan	BClayton	RCaruso**	MYoung*	RCorreia	HBerkow	JZwolinski
DATE	7/27/00	7/27/00	6/9/00	7/25/00	7/28/00	7/28/00	7/29 /00

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Mr. J. A. Scalice
Tennessee Valley Authority

SEQUOYAH NUCLEAR PLANT

cc:
Mr. Karl W. Singer, Senior Vice President
Nuclear Operations
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Jack A. Bailey
Vice President
Engineering & Technical Services
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Richard T. Purcell
Site Vice President
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

General Counsel
Tennessee Valley Authority
ET 10H
400 West Summit Hill Drive
Knoxville, TN 37902

Mr. Robert J. Adney, General Manager
Nuclear Assurance
Tennessee Valley Authority
5M Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Mark J. Burzynski, Manager
Nuclear Licensing
Tennessee Valley Authority
4X Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Pedro Salas, Manager
Licensing and Industry Affairs
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

Mr. D. L. Koehl, Plant Manager
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

Mr. Russell A. Gibbs
Senior Resident Inspector
Sequoyah Nuclear Plant
U.S. Nuclear Regulatory Commission
2600 Igou Ferry Road
Soddy Daisy, TN 37379

Mr. Lawrence E. Nanney, Director
Division of Radiological Health
Dept. of Environment & Conservation
Third Floor, L and C Annex
401 Church Street
Nashville, TN 37243-1532

County Executive
Hamilton County Courthouse
Chattanooga, TN 37402-2801

Ms. Ann Harris
305 Pickel Road
Ten Mile, TN 37880